

BROWN & RATFORD PLANT EPIDERMAL PRINTS WITH UV RESIN

by Chris Thomas

The use of UV Crystal Resins, as used for jewellery making, has revolutionised the making of leaf epidermal prints. Conceived by Gordon Brown & Robert Ratford in 2022 (1), the method was reviewed by Paul Adanick (2) in the Quekett Journal of Microscopy in 2023. I gave an account of the sheer delight in discovering and using the method earlier this year in the Balsam Post (3) – not just how simple it was, but by its ease of use and likelihood of success. With more than 100 leaf prints using Alliums, Ferns, Horsetails, Monkey-puzzles, Oak and to Zinia, I have romped through the taxonomy of plants these past months. In this article I will summarise my, and other's findings on how to get the best out of this technique.



9. Example of UV Crystal Resin, other brands work equally well.

MATERIALS

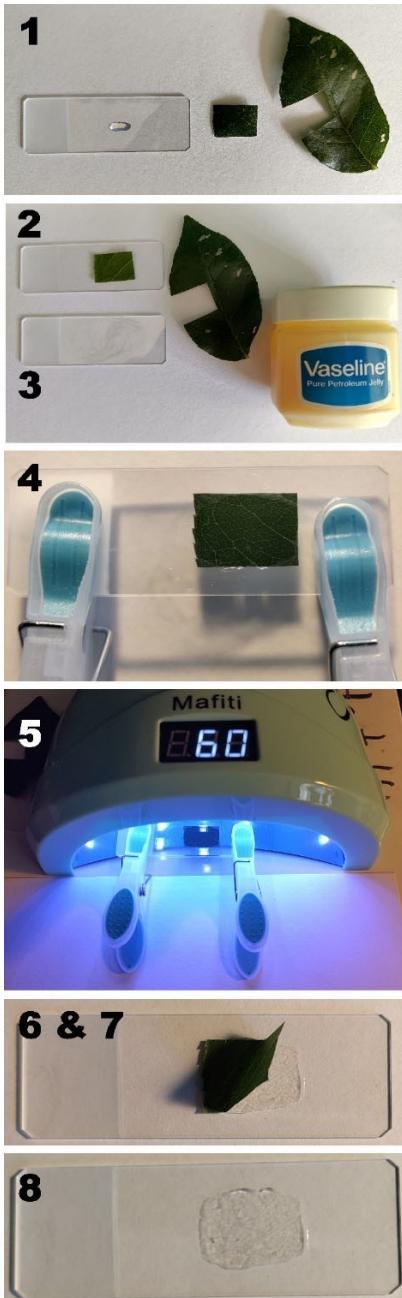
- Fresh leaves with a smooth surface or just a few hairs.
- Microscope slides.
- UV crystal resin
 - I use Vida Rosa, other brands also work – Adenick (4)
- A UV source, e.g.
 - Sunlight
 - A blue light/UV handheld torch
 - UV Nail curing tabletop light.

METHODS

Basic clamped method (1)(3)

Works with most large and robust leaves
See figure on next page.

1. Cut out a leaf square, avoiding major raised veins.
Add a drop of UV crystal resin to the centre of a microscope slide.
2. Place leaf square on top of UV crystal gel drop.
3. Place a second microscope slide liberally smeared with Vaseline, with the Vaseline side down onto the leaf.
4. Clip the microscope slide/leaf sandwich together with two clothes pegs
5. Flip the sandwich over so the UV resin side is visible on top and expose the slide for 60 seconds to sunlight or your UV blue light source.
6. Remove the clips and take off the Vaseline coated slide.
7. Carefully peel off the leaf
8. The final leaf epidermal print. Revealed.



10. Steps in making an epidermal leaf print using a Cherry leaf as example.

The key to success with this method is that the resin drop is large enough to cover a reasonable area of your leaf square, yet small enough so that none or very little squeezed out beyond the leaf square where it can form a bridge between the microscope slides. Whilst the Vaseline will prevent some adhesion if seepage does occur, too much resin and the slides WILL be glued together.

Low pressure method

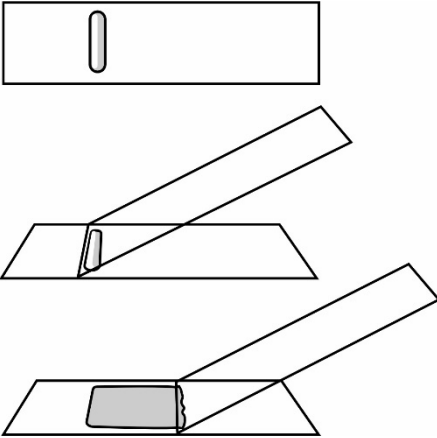
Works with most fresh leaves but very good for delicate or narrow leaves (e.g. blades of grass)

1. Cut out a leaf square or length, avoiding major raised veins. Add a drop of UV crystal resin to the centre of a microscope slide.
2. Place leaf square or fragment on top of UV crystal gel drop and allow to settle and gel to spread.
3. Hold slide at one end with fingers or clothes peg and
 - EITHER illuminate with UV light from underneath with torch for 1 minute. **AVOID SHINING LIGHT INTO YOUR EYES**
 - OR flip slide upside down and hold under UV light for 1 minute
4. When the resin has set, carefully peel off leaf to reveal print

Thin layer method

For delicate, small, very thin fresh leaves (e.g. clover or ferns) – see figure below

1. Place a line of UV crystal resin across part of the width of a slide.
2. With a second slide, held at an angle, touch the resin line lightly with the short side of the second slide and gently drag along the bottom slide to create a thin resin layer.



11. Creating a thin UV crystal resin smear for small thin leaves using 2 microscope slides.

3. Place leaf on top of UV crystal gel smear
4. Hold slide at one end with fingers or clothes peg and
 - EITHER illuminate with UV light from underneath with torch for 1 minute. **AVOID SHINING LIGHT INTO YOUR EYES**
 - OR flip slide upside down and hold under UV light for 1 minute
5. When the resin has set, carefully peel off leaf to reveal print

It takes a bit of practice to get the layer you need – just thick enough to ensure contact with leaf surface.

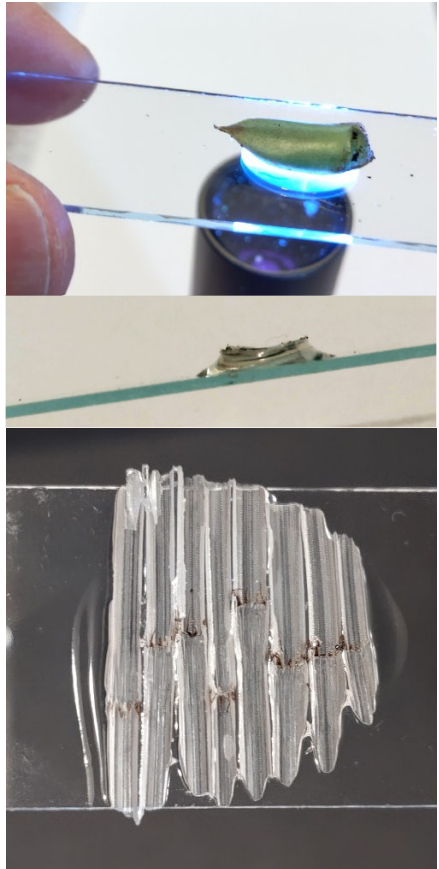
For fleshy or curved leaves that cannot be flattened

See figure in next column.

1. Place a large drop of UV crystal resin on slide and immediately place the thick leaf or stem onto it.
2. illuminate with UV light from underneath with torch for 1 minute.

AVOID SHINING LIGHT INTO YOUR EYES

3. When the resin has set, carefully peel off leaf to reveal print



12. Making resin prints of 3D leaves. Top: House Leek leaf on drop of resin being set with UV light. Middle: the resin print side on to show its 3D nature. Bottom: 3D Print of sections of Equisetum stems on slide.

WHAT TO LOOK AT

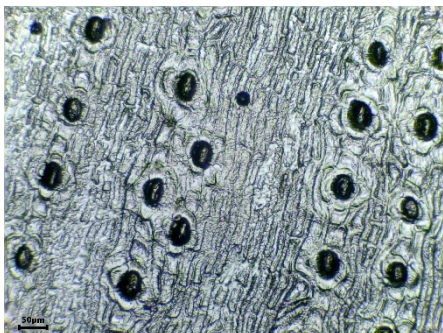
Any relatively smooth plant surface including leaves, petals, herbaceous plant stems etcetera.

The method is usually used to look at the patterns and shapes of leaf stomata

and the epidermal pavement cells around them, and I give a description of stomatal structure and function with some illustrative examples in my 2024 Balsam Post article.

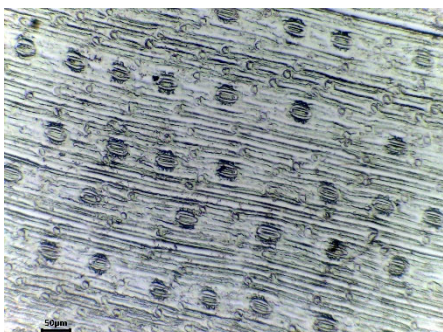
If looking at leaves, it is worth making prints of both the top leaf surface and the underside – on the same slide at the same time for comparison.

Stomata on conifer leaves tend to be sunken.



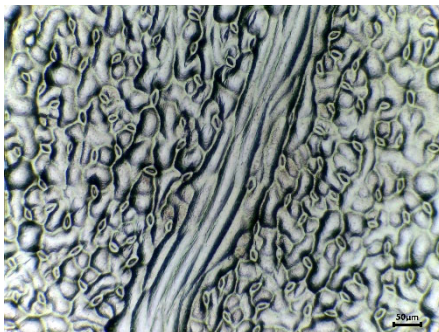
13. Monkey Puzzle leaf print with sunken stomata 10x objective.

Those on monocotyledonous plants (grasses, Iris etc. are often arranged in rows on both sides of a leaf.



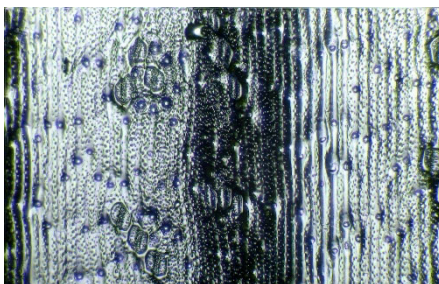
14. Wheat leaf print with stomata in rows. 10 x objective.

In dicotyledonous plants (deciduous trees, many flowering plants), the stomata are found on the leaf underside.



15. Dandelion leaf print, leaf underside. 10x objective.

But stems can be interesting – as in the Horsetails (*Equisetum* spp.).



16. *Equisetum* sp stem epidermis print, 10x objective.

You can use the method on petals.

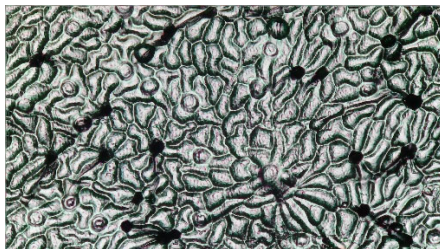
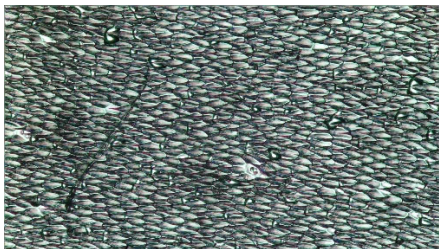
I found the difference between the outer side and the inside of a Pitcher plant illustrated how insects could easily fall in and not get out of the pitcher! (see images below)

TROUBLESHOOTING

- **Difficult samples:** Some leaves just tear rather than separate.

Leaves with hairs will be bound strongly and resist peeling off.
Dried material will also not peel well.

Try the “Sample does not come off the resin” approach further down



17. Pitcher plant epidermises. *Left: Inside of Pitcher surface with ultrasmooth cells preventing insects from getting a foot hold. Right: Outer side of pitcher with stomata and a rougher surface, with a few leaf hairs. 10x objective.*

- **Clamped slides won't separate:**
Likely due to excess resin bonding two slides together. You could try gentle pressure from one slide end to lift slides apart. Risky – likely to fracture one or both slides. Repeat print with a fresh sample and less resin – or try low pressure method.
- **Excessive number of air bubbles in print:** Happens occasionally. Repeat with a fresh sample using the low pressure or thin layer method – lowering the leaf sample from one side of the resin drop and allowing the sample to roll over and onto the resin until flat.
- **Sample does not come off the resin:**

If due to resin flooding over edge of sample and clamping it to slide, try using forceps to lift a free edge and lift off as much tissue as possible.

If sample itself adheres strongly to resin and won't come off:

First try gently scoring the exposed surface of the bound leaf with a pointed wooden toothpick. Then use a toothbrush and rigorously brush the leaf under cold running water, to erode away leaf material to reveal leaf print.

If that does not work:

Apply 20% sodium hydroxide to the leaf and leave for 20 minutes, then clean under cold running water with a toothbrush (adapted from Adanick (4)).

Paul also adds that 20% Potassium hydroxide works too, though more slowly (Adenick, personal communication).

- **Cleaning slides of resin**

Soak slides in very hot water and the resin will peel off easily (2).

REFERENCES

1. Gordon Brown & Robert Ratford. (2022), Correspondence with Adanick 2023 (2) below.
2. Paul D. Adanick (2023), A survey of commonly used leaf epidermal imprint techniques and two improved methods, The Quekett Journal of Microscopy 44 (Part 5), pp325-323
3. Chris Thomas (2024), Leaf epidermal prints using UV Crystal Resin, Balsam Post, Issue 143 (April), pp 4-11
4. Paul D Adanick (2024), Letter about Chris Thomas' Leaf Print Article in BP 143, Balsam Post, Issue 144, pp 17 & 39.